

E-Z SCAN™ AB5500⁺ E-Z SCAN™ B5500⁺



1979 MARCUS AVENUE, LAKE SUCCESS, NY 11042 USA

Tel 800-227-1285 or 516-354-0900

Fax 516-354-5902 www.sonomedinc.com

SERVICE MANUAL

Table of Contents

1.	Preface	3
	1.1 EZ-Scan B5500+.....	3
	1.2 EZ-Scan A/B5500+.....	3
2.	Theory of Operation	4
	2.1 A-Scan Function.....	4
	2.2 B-Scan Function.....	4
3.	System Components	5
4.	System Specifications	6
	4.1 Regulatory Requirements.....	6
	4.2 Safety Regulations.....	6
	4.3 Environmental Conditions.....	6
	4.4 Physical.....	6
	4.5 Electrical.....	6
	4.6 Interface.....	6
	4.7 Probes.....	6
	4.8 Display.....	6
	4.9 Printer.....	7
5.	A-Scan System Specifications	8
	5.1 Calibration.....	8
	5.2 Capture Modes.....	8
	5.3 Examination Modes.....	8
	5.4 Typical Ultrasound Intensities in Tissues.....	8
	5.5 A-Scan Waveform Processing.....	8
	5.6 Statistical Analysis.....	8
	5.7 IOL Analysis.....	8
	5.8 IOL Calculations.....	8
	5.9 Measurement Accuracy.....	8
	5.10 A-Scan Amplifier.....	8
	5.11 User Profiles.....	8
	5.12 General Specifications/Features.....	8
6.	B-Scan System Specifications	10
	6.1 Examination Modes.....	10
	6.2 Display Scale.....	10
	6.3 Probe.....	10
	6.4 Measurements.....	10
	6.5 Amplifier.....	10
	6.6 Magnification.....	10
	6.7 Display Resolution.....	10
	6.8 Processing.....	10
	6.9 Freeze.....	10
	6.10 Image.....	10
	6.11 Gray Scale.....	10
	6.12 Display.....	10
	6.13 Typical Ultrasound Intensities in Tissues.....	10
	6.14 General Specifications/Features.....	10
7.	Trouble Shooting B5500+	11
	7.1 Factor Defaults Reset.....	11
	7.2 Touch Screen Calibration.....	13
	7.3 RGB Fill.....	14
	7.4 Video Output.....	14
	7.5 Joystick Alignment.....	15
	7.6 Rotary Encoder.....	15
	7.7 System Information.....	16
	7.8 Mixed Pattern Test.....	16

Table of Contents, con't.

	7.9 Cal Pattern Distance Test.....	19
	7.10 Cal Pattern Area Test.....	20
	7.11 Losing date, time and user information.....	22
	7.12 Unit does not turn on.....	23
	7.13 Rear Connector Discriptions.....	23
	7.14 LCD Image is Upside Down.....	23
8.	Trouble Shooting A/B5500+	24
	8.1 A-Scan Calibration.....	24
	8.2 Measure.....	25
	8.3 Losing date, time and user information.....	25
	8.4 A-Scan PCB.....	26
	8.5 A-Scan Probe Cable replacement.....	27
9.	Routine Maintenance	29
	9.1 System General Inspection.....	29
	9.2 Enclosure Cleaning.....	29
	9.3 Probes Cleaning.....	29
	9.4 Storage.....	30
	9.5 Probe general Inspection.....	30
10.	Unit Assembly	31
	10.1 Top cover Bill of Materials.....	31
	10.2 Top Cover Assembly Drawing.....	32
	10.3 Bottom Cover Bill of Materials.....	33
	10.4 Bottom Cover Assembly Drawing.....	34
	10.5 Accessories Bill of Materials.....	35
	10.6 Accessories Drawings.....	36
11.	Schematics	37
	11.1 Clock Generator.....	37
	11.2 Front End Interface.....	38
	11.3 Power Supply.....	39
	11.4 Pulser Receiver.....	40
	11.5 Servo Controller.....	41
	11.6 System Processor.....	42
	11.7 Video Interface.....	43
	11.8 Xilinx Configuration.....	44
	11.9 Xilinx Power/Decouple.....	45
	11.10 Xilinx RAM Interface.....	46
	11.11 Xilinx Test Points.....	47

Preface

This manual is intended to provide assistance in maintaining and repairing the E-Z Scan 5500+ series of instruments manufactured by Sonomed, Inc. For additional technical assistance, please contact Sonomed customer service at 1-800-227-1285.

General Description

The E-Z Scan 5500+ series is the latest general ophthalmic biometry instrument introduced by the industry leading Sonomed. The series consists of two different models:

1.1 E-Z Scan B5500+

This B-Scan system allows for measuring a two-dimensional image of an eye along one plane.

1.2 E-Z Scan A/B5500+

This A-Scan system allows for measuring the axial length (AXL), anterior chamber depth (ACD) and lens thickness of an eye and for calculating the associated IOL power for an implanted lens.

Both systems utilize a high-resolution backlit touch screen liquid crystal display (LCD) by which the user can enter information and view data and calculations. Adjustable legs can be tilted to several angles for user comfort. After completion of measurements and calculations, a hardcopy may be obtained of the results using the video printer.

Theory of Operation

2.1 A-Scan Function

One of the major applications of A-Scan is to measure the axial length of the eye in order to calculate the necessary power of an intraocular lens replacement (such as required in the treatment of cataracts).

In A-Scan, a beam of ultrasound is transmitted along a fixed line through the eye and the reflected echoes are displayed. An echo is produced whenever the ultrasound beam encounters a boundary between two media having different values of acoustic impedance. The acoustic impedance is a function of density and elasticity and the amount of energy reflected depends upon the difference in the acoustic impedance of the two media. A-Scan is equipped with software that calculates the distance between the echoes.

The probe acts as the interface between the instrument and the patient. The probe contains a piezoelectric crystal, which converts electrical energy into ultrasound when transmitting and then acts as a detector to convert the received ultrasound echoes into electrical signals for display and measurement. The A-Scan probe contains a red LED fixation light in its center. The fixation light provides a target, which assists the operator to align the visual axis of the eye being examined. To minimize indentation of the eye, which is caused by the operator applying excessive pressure while holding the probe on the eye, A-scan probes feature "Soft-Touch". This feature minimizes the compression effect by allowing the probe handle to float on bushings located inside the probe handle.

2.2 B-Scan Function

The operation of the B-Scan is similar to a radar operation. A short ultrasound wave is produced by a transducer and sent to the eye. Part of the energy of that wave is reflected back to the transducer from various structures of the eye (lens, retina, etc.). The reflected energy is converted into electrical signals that are amplified and displayed on the LCD as an intensity. Since the reflected energy is proportional to the reflected properties of the different eye structures, one can examine the eye by observing the resulting grey or color scale image.

The ultrasound transducer is located in the B-Scan probe and is driven by two (2) solenoids to produce a 60° sector scan. The sector scan is divided into 256 rays. The data acquired along each ray is digitized at 512 discrete time intervals (pixels) and each sample voltage is encoded into 7 bits of information.

The acquired information is stored in one (1) of the two (2) B-Scan memory buffers. At any time during the acquisition, the content on one memory buffer is displayed while the other is updated with new data from the amplifier.

The display control maps data in the memory buffer onto the LCD screen, thus showing sector scans. The microprocessor periodically checks touch screen controls and calculates mapping coefficients, to pan the image.

There is a simultaneous vector display that shows the signal along a selected ray, represented as an amplitude waveform. This supplemental information enables the doctor to differentiate between the two (2) signals that have the closest intensities of grey.

System Components

LCD Backlit Display with Touch Screen Overlay

The touch screen is a highly sensitive device that enables selections to be made and recorded on the color liquid crystal display. On screen selections should only be made by gently using a finger or the provided Stylus pen (do not use pencil, pen or other sharp objects). The LCD display and touch screen mount on the front cover.

Bail Stand

The bail stand consists of two adjustable legs and two neoprene pads. When shipped, the legs will lie flat. The legs can be tilted to one of three angles for user comfort.

Note: Do not remove the neoprene pads.

Video Out

Connector located on the rear of the instrument. The signal is black and white. Connects with the video printer provided.

Power On - Off Switch

Two position slide switch located on the rear of the instrument. The LED on the front panel will illuminate green when the switch is in the Power On position. In the Off position the LED will not illuminate.

DC Input Port

Interfaces to the Sonomed AC Adapter, 15 VDC @ 2.0 A, Part No. 9200-1409-1A

RS 232 Port

Connector located on the rear of the unit. Connects with PC (software required).

A Scan Probe Port (A/B5500+)

5-pin Lemo connector located on the side of the instrument. Interfaces to the A-Scan probe.

B-Scan Probe Port (B5500+)

10-pin Lemo connector located on the side of the instrument. Interfaces to the B-Scan probe.

Foot Switch Port

1-pin jack connector located on the rear of the instrument.

AC Adapter

Desktop regulated AC/DC power supply.

Video Printer

SONY Black & White Video Graphic Printer

A-Scan Probes

Styles: Standard and Soft-Touch

B-Scan Probe

Coupling Gel

The coupling gel is provided with the B5500+ and A/B5500+ units.

Stylus Touch Pen

Instruction Manual

An instruction manual is supplied with each unit.

System Specifications

4.1 Regulatory Requirements

The E-Z Scan 5500+ series of instruments shall meet and comply with the following regulatory requirements:

- * European Medical Device Directive (MDD 93/42/EEC)
- * CE mark including EMC "residential class"
- * United States FDA regulations for ultrasonic medical devices.

4.2 Safety Regulations

The E-Z Scan 5500+ series shall comply with the safety requirements of IEC 60601-1 and the European norm EN 60601 which include:

- *IEC 60601-1-1, Safety requirements for medical electrical systems
- *IEC 60601-1-2 Electromagnetic compatibility - requirements and tests
- *EN 60601-1-2:1993, EMC for EU Medical Devices Directive
- *IEC 60601-1-4, Programmable electrical medical systems

4.3 Environmental Conditions

Temperature, Operating: 5 to 40° C
(41 to 104° F)
Temperature, Storage: -40 to 70° C
(-40 to 158° F)
Humidity, Operating: 10 to 90%,
non-condensing
Humidity, Storage: 10 to 90%,
non-condensing

4.4 Physical

Dimensions:
Width 31.7 cm (12.5")
Depth 25.4 cm (10.0")
Height 8.2 cm (3.25")

Weight: 2.4 kg (5.25 lbs)
Enclosure: Plastic, off-white color,
internal EMC shielded

4.5 Electrical

The E-Z Scan 5500+ series shall be powered from the AC mains using an external "brick" power supply.

Power Consumption: 10.0 W (typical)
Line Voltage: 100/120/220 Volts AC $\pm 10\%$
Line Frequency: 50/60 Hz
DC Output: 15 VDC
2.0 A

4.6 Interface

DC Input: 1-pin jack connector
Foot Pedal: 1-pin jack connector
Probe Input:
A-Probe: 5-pin with insertion key
B-Probe: 10-pin with insertion key
Printer Output: BNC connector

4.7 Probes

A-Scan Probes: Direct contact
Styles: Standard Solid Tip
Soft-Touch
Immersion
Frequency: 10 MHz $\pm 10\%$
Focal Length: Standard: 25 mm ± 3 mm
Soft-Touch: 25 mm ± 3 mm
Fixation Light: Internal red LED
Pulse repetition frequency: 19.2 Hz

B-Scan Probes: Mechanical sector scan
Frequency: 10 MHz $\pm 10\%$
Focal Length: 24 mm ± 2 mm
Probe Tip Diameter: 1.75 mm
Pulse repetition frequency: 3800 Hz
ISO 9000 Certified

System Specifications, con't

4.8 Display

Type: TFT Active Matrix Color LCD with touch screen overlay (262,144 colors)

Resolution: 640 pixels (H) x 480 pixels (V)

Dimensions: 6.5" (17cm) Diagonal

High Luminance (250:1)

4.9 Printer

Model: Sony UP-890MD

Type: Video printer

Paper Size: Roll paper

Width: 110 mm (4.3")

Diameter: 50 mm (2.0")

Video Output: RS-170 BNC for B/W Video
Printer, VCR and remote viewing

A-Scan System Specifications

5.1 Calibration

Calibration Mode: User invoked mode, will confirm proper functioning using a test target

Calibration Distance: 10.0 mm \pm 0.1 mm

Gain Control: Manual or automatic gain selection.

5.2 Capture Modes

Automatic Capture: Normal Cataract

Dense Cataract

Aphakic

Pseudophakic

A-scan will automatically freeze when an acceptable waveform has been acquired.

Manual Capture: User activated using touch screen or foot pedal.

5.3 Examination Modes

Contact: Direct contact of probe tip onto cornea.

Immersion: Water bath standoff of probe tip.

5.4 Typical Ultrasonic Intensities in Tissue

I_{SPTA}: 0.0068 mW/cm²

I_{SPPA}: 3.11 W/cm²

MI: 0.085

Ultrasonic Power: .00134 mW

5.5 A-Scan Waveform Processing

Waveform Display: Real-time update

Display Scale:

Minor markers at 1.0 mm intervals

Major markers at 5.0 mm intervals

Display Range: 49 mm

Storage: Up to five waveforms with associated statistics

5.6 Statistical Analysis

Average, Standard Deviation, Range and Maximum Difference from average

5.7 IOL Analysis

Standard Programs: Binkhorst
Regression-II
Theoretic-T
Holladay
Hoffer-Q
Haigis (optional)

5.8 IOL Calculations

2 Tables of 9 Operator AOL

Displayed in 1/2 Diopter steps

Selectable Refractions

Customizable IOL Constants

Measurement Limits (in Automatic mode @ 1550 m/s)

AXL: 18 - 40 mm

Lens: 2 - 6 mm

ACD: 2 - 6 mm

Vitreous

5.9 Measurement Accuracy

Electrical: \pm 0.023 mm

Clinical: \pm 0.1 mm

Measurement Range: 18-40 mm

Calibration: Automatic with built-in calibration cylinder

5.10 A-Scan Amplifier

Nominal Gain: 40-80 dB

Control: Variable gain set by user

Low Noise

5.11 User Profiles

Permanent storage of settings for up to five users.

User Profiles: Preferred IOL formula

Personal Surgeon Factor

5.12 General Specifications / Features

Printing mode: Standard Video Out

Review: Stored A-scan patterns, A-scan measurements and statistics

Displays: Multiple screens available for tabled, summarized and compared calculations.

A-Scan System Specifications Con't

Memory: Stores 5 scans and measurements, selected formula, IOL constants and user name.

Report Data: Patients Name, ID#, Eye examined, K-readings, User Name, Date & Time.

Live A-Scan Display

Axial length, anterior chamber depth, and lens thickness measurements for each scan.

Axial length average and standard deviation for up to 5 scans.

Data Entry: Full alpha-numeric via touch-screen.

Adjustable legs for angled viewing for 0-60°

B-Scan System Specifications

6.1 Examination Modes: B-only
B/a
A/b

6.2 Display Scale: Electronic Markers @
2.0mm Intervals

Measurement Accuracy
Electronic: ± 0.0484 mm
Clinical: ± 0.1 mm

6.3 Probe: 10MHz, Focused Transducer,
30 frames/sec

6.4 Measurements: Distance and area

6.5 Amplifier: 100 dB Gain, Logarithmic /
Linear / S-Curve, Gain and TVG controls

6.6 Magnification: Continuous Zoom
(0.5x – 2.0x) with Pan (joystick controlled)

6.7 Display Resolution: 640 x 480 Pixels,
color VGA with optimal tissue resolution of
0.15 mm

6.8 Processing: Reject below level,
enhance contour and texture.

6.9 Freeze: Foot pedal or touch screen
activated

6.10 Image: B-Scan with simultaneous
selectable vector A-Scan

6.11 Gray Scale: 256 levels

6.12 Display: 60° sector fan, 128 lines,
Grey Scale, B/a presentation (B emphasized)
or A/b (A emphasized), Gain/TVG,
Electronic Scale, Amplifier, OD/OS,
Velocity, Probe Orientation, Patient and
User Names, Date/Time.

**6.13 Typical Ultrasonic Intensities in
tissue:**

B-scan: (autoscanning)
 I_{SPTA} : 0.881 mW/cm^2
 I_{SPPA} : 11.45 W/cm^2
MI: 0.151
Ultrasonic Power 0.133 mW

6.14 General Specifications / Features

Maintains high resolution at all
magnifications.

Pan feature using built-in “joystick” control
Gain and TVG controls for optimal
diagnostic capabilities.

Selectable Color or Grey Scale image.

Software enhancement capability of frozen
image.

Selectable, simultaneous A-scan vector.

Sealed B-scan probe provides smooth
scanning with virtually no audible sound

Five user selections.

Trouble Shooting B5500+

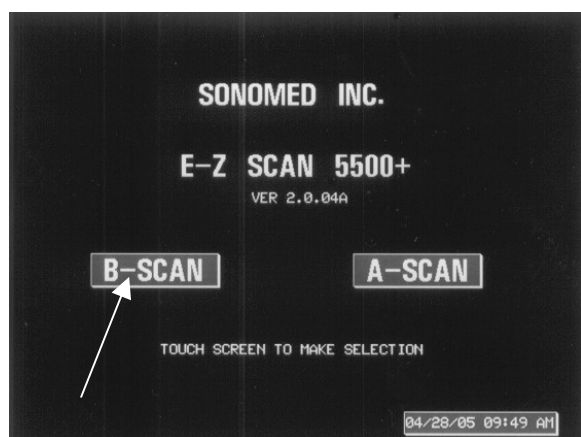


Fig. 1

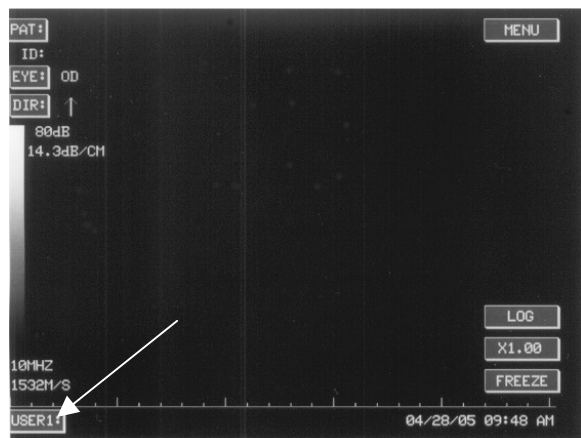


Fig. 2

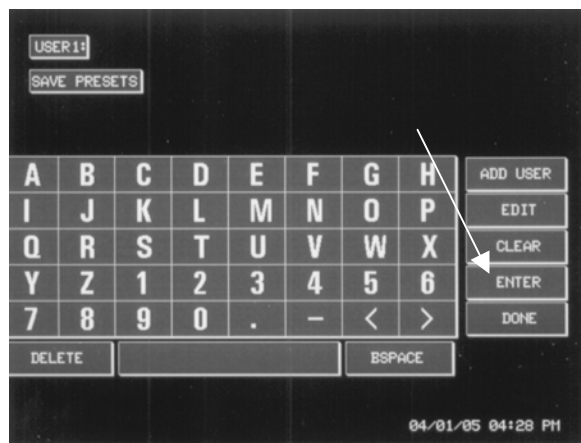


Fig. 3

7.1 Factory Defaults Reset

It is recommended that the unit be turned OFF before starting this procedure to ensure that the RAM is clear and the microprocessor is reset.

Turn the unit on. The unit will display the screen as shown in figure #1.

Touch the B-SCAN field, the unit will display the screen as shown in figure #2.

Touch the USER 1 field, the unit will display the screen as shown in figure #3.

Type in the letters SET and then the ENTER field, the unit will display the Calibration & Test screen as shown in figure #4.

Touch the FACTORY RESET field, the unit will display the screen as shown in figure #5.

Touch the RESET field, the unit will display the screen as shown in figure #6.

Touch the DONE field, the unit will display the Calibration & Test screen (figure #4).

WARNING! Once the system is reset, all entered data and scans are erased.

Trouble Shooting B5500+ con't.

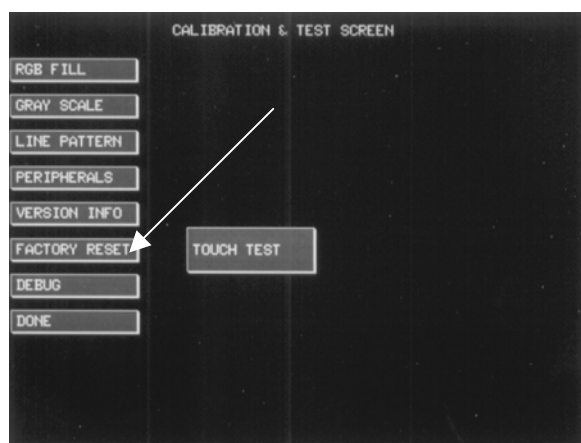


Fig. 4

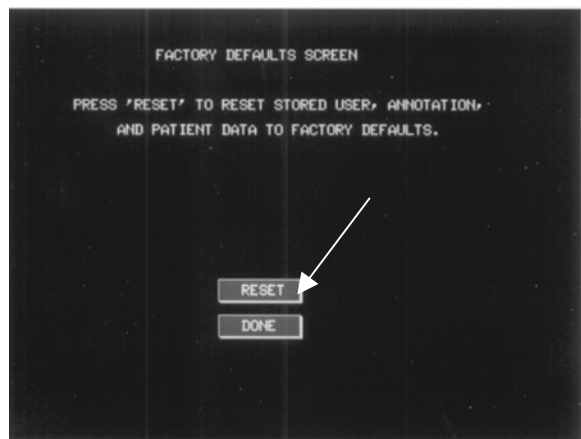


Fig. 5

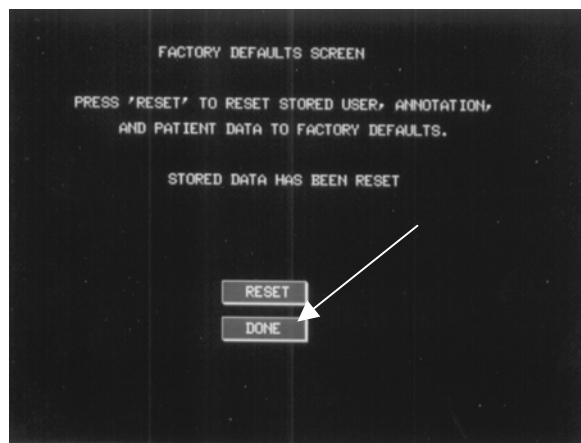


Fig. 6

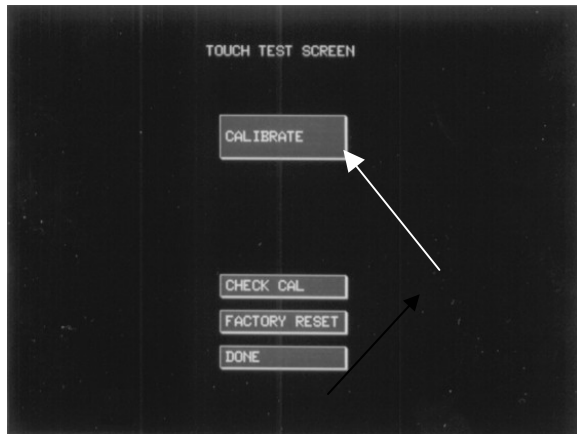


Fig. 7

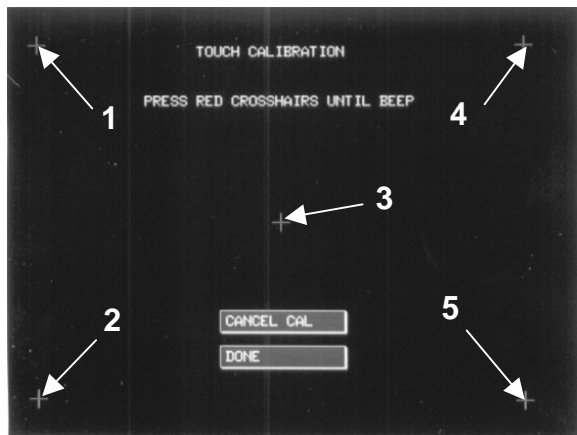


Fig. 8

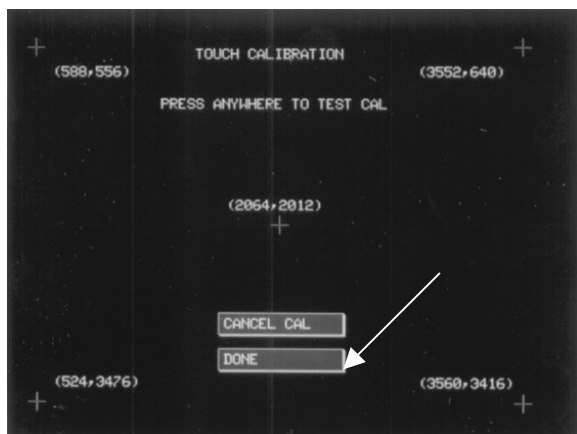


Fig. 9

7.2 Touch Screen Calibration

To verify that the Touch Screen is calibrated, repeat the first several steps in the Factory Defaults Restore section until the unit displays the Calibration & Test screen (figure #4).

Touch the TOUCH TEST field, the unit will display the screen as shown in figure #7.

Touch the CALIBRATE field, the unit will display the screen as shown in figure #8.

Press all the red crosshairs in the sequence illustrated in figure #8 until they all beep. The screen will automatically go to the screen as shown in figure #9.

Press in several random points on the screen to test calibration. The response points displayed on the screen will turn green. The response points should be within 3mm of the pressed points. If the green response points are not displayed beneath the pressed points, contact the Sonomed service department.

Touch the DONE field, to return to the Calibration & Test screen (figure #4).

7.3 RGB Fill

To Verify that the three basic colors on the LCD are working, repeat the first several steps in the Factory Defaults Restore section until the unit displays the Calibration & Test screen (figure #4).

Touch the RGB FILL field.

The LCD display will scroll the colors Red, Green and Blue continuously. All the pixels on the screen should be the same color (not spots of mixed colors or black pixels) If the screens are not completely Red, Green or Blue, contact the Sonomed service department.

Press the touch screen in any spot for approximate 2 seconds, the unit will return to the Calibration and Test Screen (figure #4).

7.4 Video Output

To verify that the Video output is correct, repeat the first several steps in the Factory Defaults Restore section until the unit displays the Calibration & Test screen (figure #4).

Touch the GREY SCALE field, the unit will display the screen as shown in figure #10.

Using a scope, measure and verify peak to peak voltage is 1.0VppVDC+/- 10mVpp. This measurement should be taken at the video output on the rear of the instrument.

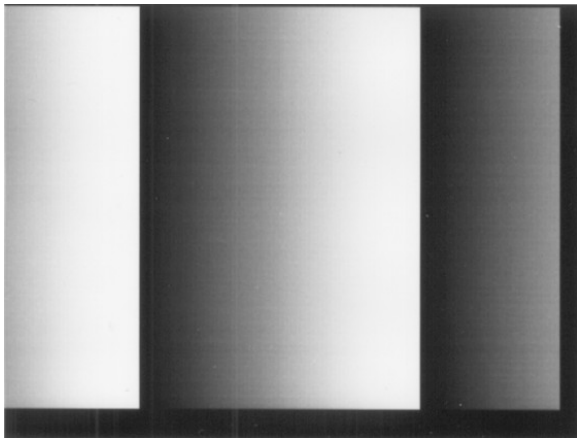


Fig. 10

Trouble Shooting B5500+ con't.

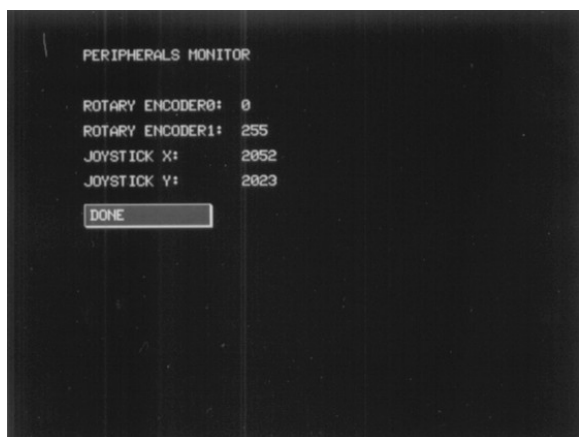


Fig.11

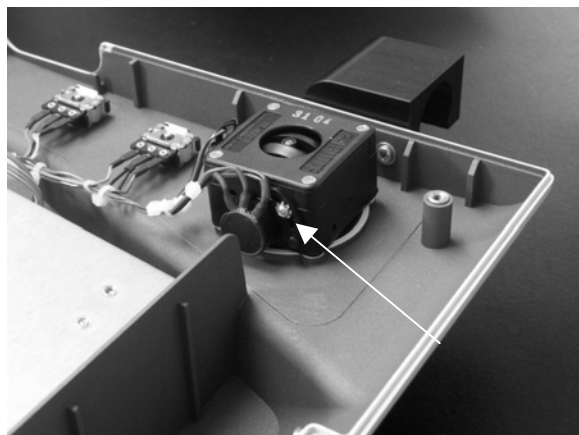


Fig.12



Fig. 13

7.5 Joystick Alignment

To verify the the Joystick is aligned properly, repeat the first several steps in the Factory Defaults Restore section until the unit displays the Calibration & Test screen (figure #4).

Touch the PERIPHERALS field, the unit will display the screen as shown in figure #11.

The Joystick X and Joystick Y numbers should be 2025 +/- 20.

If the X or Y numbers do not fall within this range, the Joystick requires alignment, as follows:

Remove the four screws that attach the top and bottom covers.

To adjust the Y Joystick, loosen screw indicated in figure #12. Adjust the potentiometer until it falls within the appropriate range and tighten screw.

To adjust the X Joystick, loosen screw indicated in figure #13. Adjust the X potentiometer until it falls within the appropriate range and tighten screw.

If the Joystick can not be adjusted, call the Sonomed service department.

7.6 Rotary Encoder

To Verfiy that the Rotary Encoders 0 and 1 are working properly, repeat the first several steps in the Factory Defaults Restore section until the unit displays the Calibration & Test screen (figure #4).

Trouble Shooting B5500+ con't.

Touch the PERIPHERALS field, the unit will display the screen as shown in figure #11.

Rotate the corresponding potentiometer.

The full range of numbers should be 0 – 255 in increments of 1. If the Encoder does not increment properly, replace the encoder, or call the Sonomed service department.

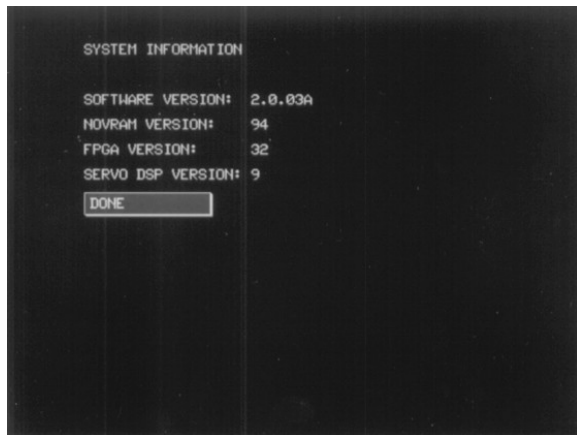


Fig. 14

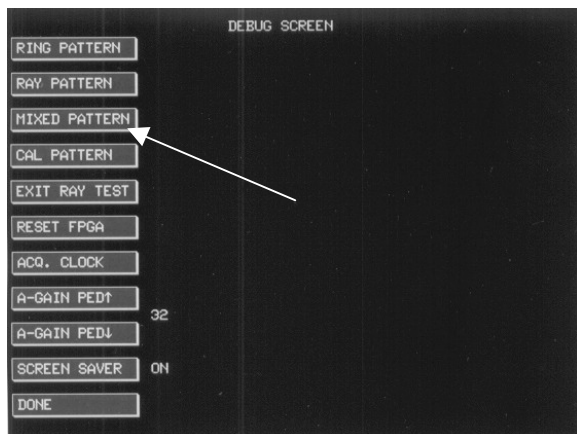


Fig. 15

7.10 System Information

To verify the System Information version, repeat the first several steps in the Factory Defaults Restore section until the unit displays the Calibration & Test screen (figure #4).

Touch the VERSION INFO field, the unit will display the screen as shown in figure #14.

7.8 Mixed Pattern Test

Repeat the first several steps in the Factory Defaults Restore section until the unit displays the Calibration & Test screen (figure #4).

Touch the DEBUG Field, the unit will display the screen shown in figure #15.

Touch the MIXED PATTERN field and the unit will display the screen shown in figure #16.

Touch the DONE field 3x and the unit will display the screen shown in figure #2.

Touch the MENU field and the unit will display the screen shown in figure #17.

Trouble Shooting B5500+ con't.

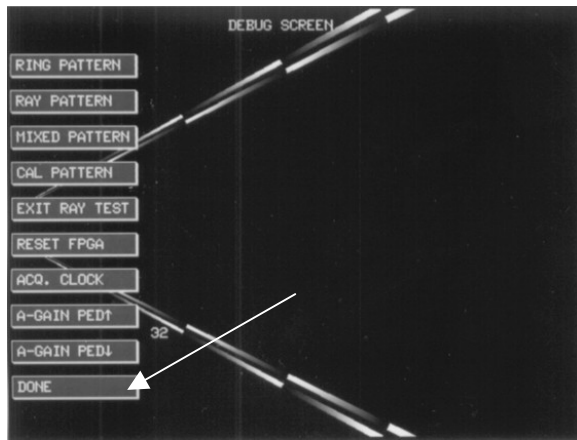


Fig. 16

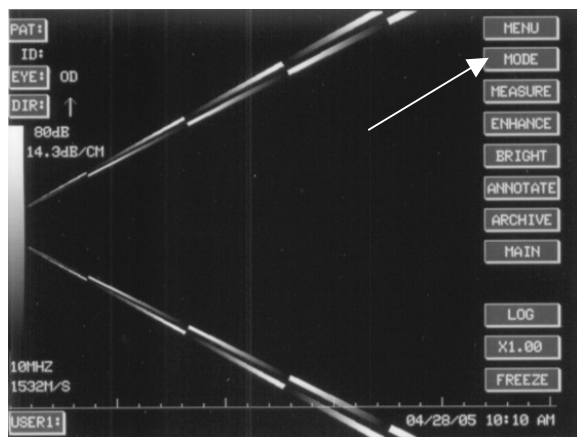


Fig. 17

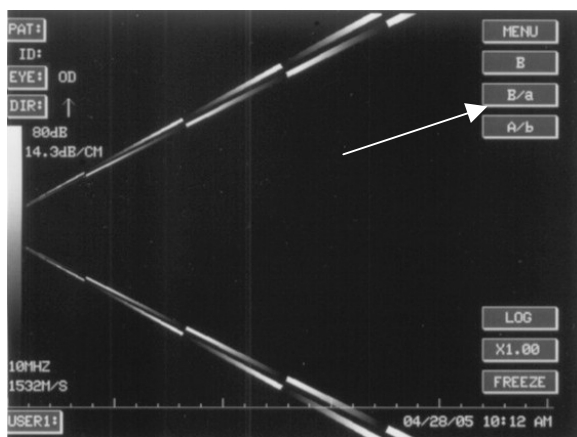


Fig. 18

Touch the MODE field and the unit will display the screen as shown in figure #18.

Touch the B/a field and the unit will display the screen as shown in figure #19.

Touch the A-VECTOR field and the unit will display the screen as shown in figure #20.

Touch and hold the (+) field until the A-Scan vector reaches the top pattern and the unit will display the screen shown in figure # 21.

If any of the screens do not appear as shown, contact the Sonomed service department.

Trouble Shooting B5500+ con't.

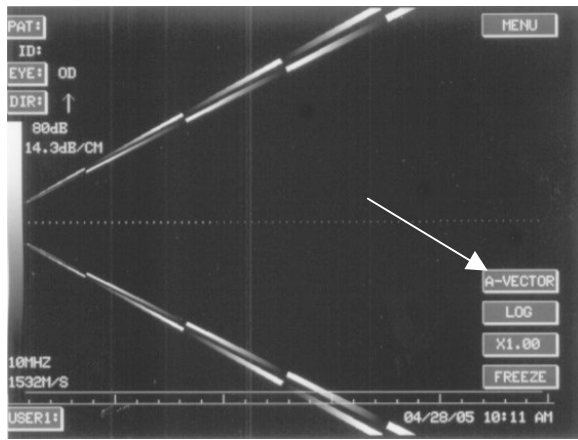


Fig. 19

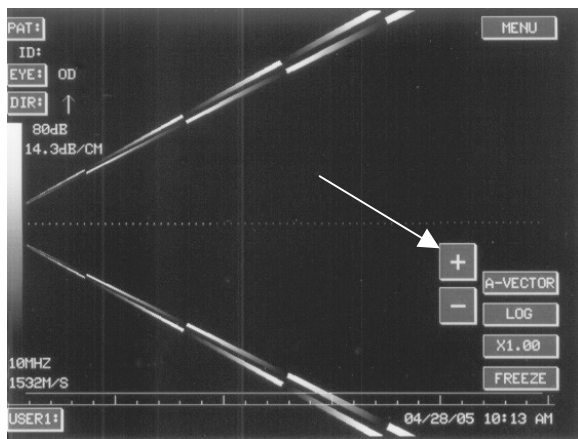


Fig. 20

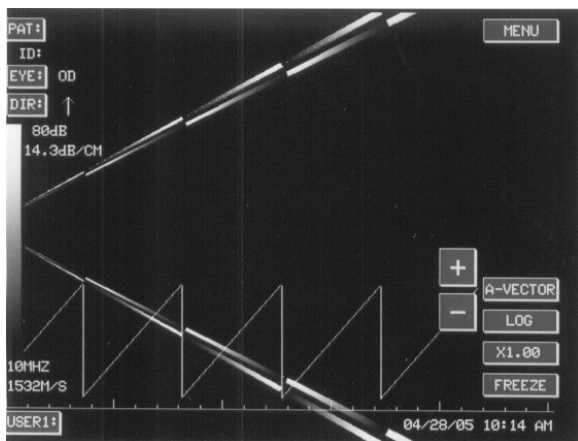


Fig. 21

Trouble Shooting B5500+ con't.

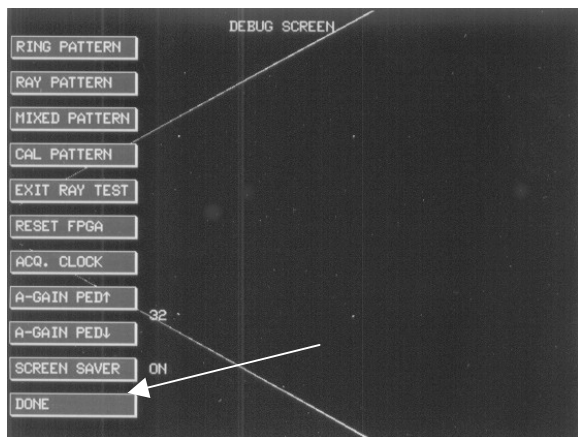


Fig. 22

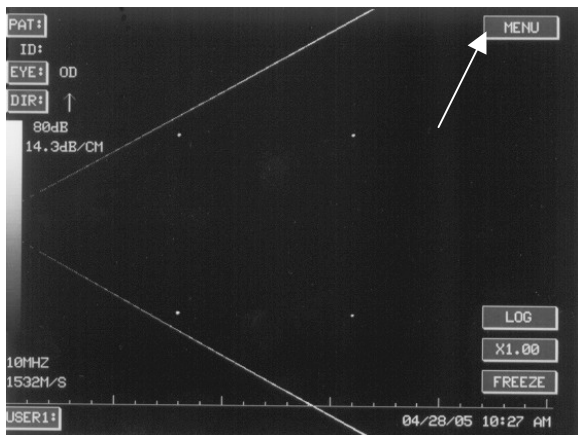


Fig. 23

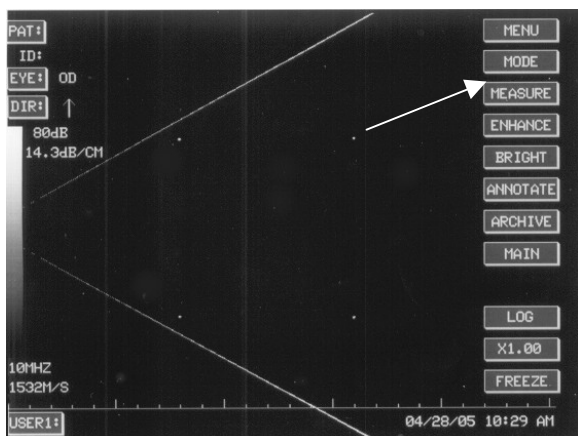


Fig. 24

7.9 Cal Pattern Distance Test

Repeat the first several steps in the Factory Defaults Restore section until the unit displays the Calibration & Test screen (figure #4).

Touch the CAL PATTERN field and the unit will display the screen as shown in figure #22.

Touch the DONE field 3x and unit will display the screen as shown in figure #23.

Touch the MENU field and the unit will display the screen as shown in figure #24.

Touch the MEASURE field and the unit will display the screen as shown in figure #25.

Touch the DISTANCE field and the unit will display the screen as shown in figure #26.

Using the joystick, move the flashing cursor and align it with the upper left dot as shown in figure #27 and touch the SET field.

Move the flashing cursor to the upper right dot as shown in figure #28 and touch the SET field.

The measurement should be 15.8 – 16.2 mm.

Touch the NEXT DISTANCE field and move the flashing cursor to the lower left dot and touch the SET field.

Move the flashing cursor to lower right dot and press the set field. The measurement should be 15.8-16.2mm as shown in figure #29.

Trouble Shooting B5500+ con't.

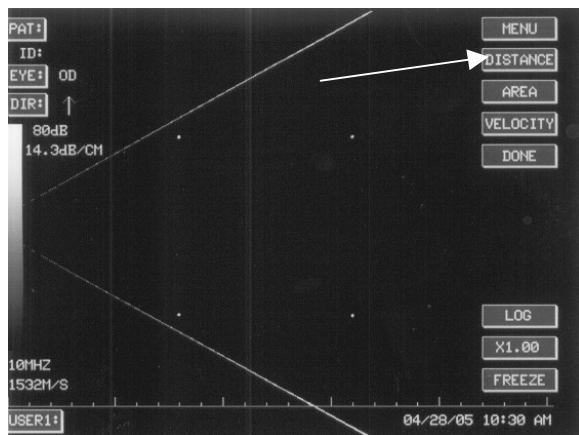


Fig. 25

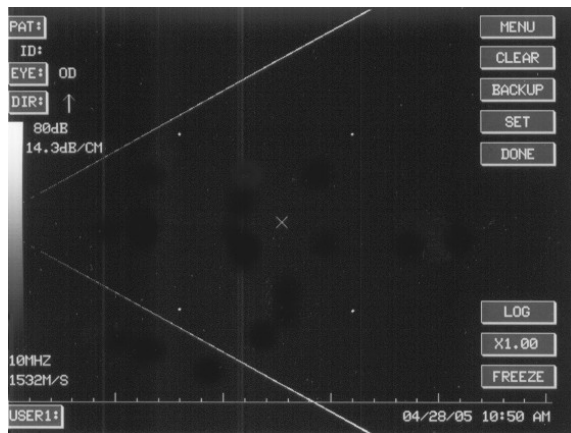


Fig. 26

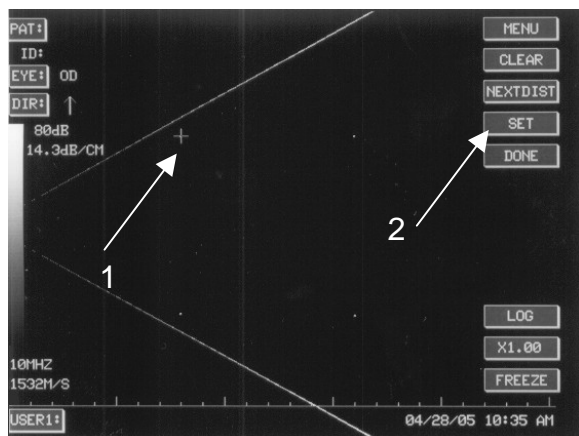


Fig. 27

These measurement are based upon a velocity of 1632 M/s.

If any of the screens do not appear as shown, contact the Sonomed service department.

7.10 Cal Pattern Area Test

Repeat the first several steps in the Factory Defaults Restore section until the unit displays the Calibration & Test screen (figure #4).

Touch the CAL PATTERN field and the unit will display the screen as shown in figure #22.

Touch the DONE field 3x and unit will display the screen as shown in figure #23.

Touch the MENU field and the unit will display the screen as shown in figure #24.

Touch the the MEASURE field and the unit will display the screen as shown in figure #25.

Touch the AREA field and the unit will display the screen as shown in figure #30.

Move the flashing cursor and align it with the upper left dot and touch the SET field.

Move the flashing cursor to the upper right dot.

Move the flashing cursor to the lower right dot.

Move the flashing cursor to the lower left dot and touch the SET field.

The measurement should be 252-262 sq.mm as shown in figure #31.

Trouble Shooting B5500+ con't.

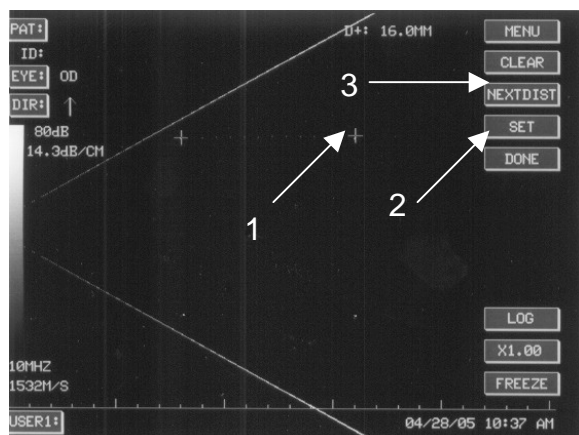


Fig. 28

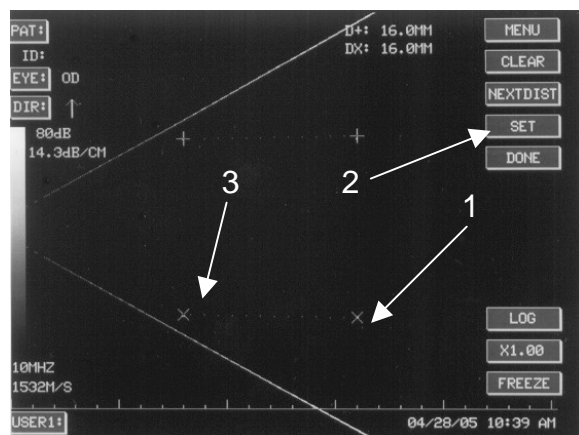


Fig. 29

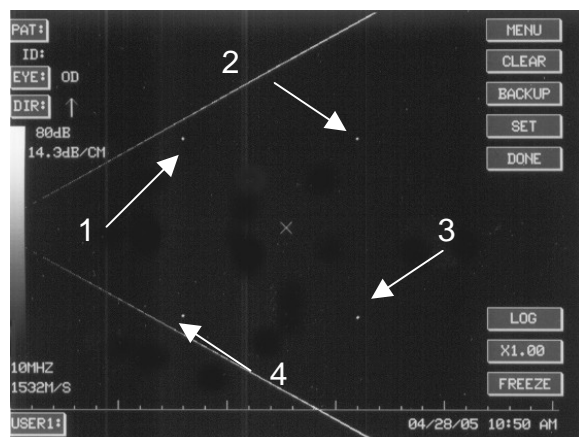


Fig. 30

Trouble Shooting B5500+ con't.

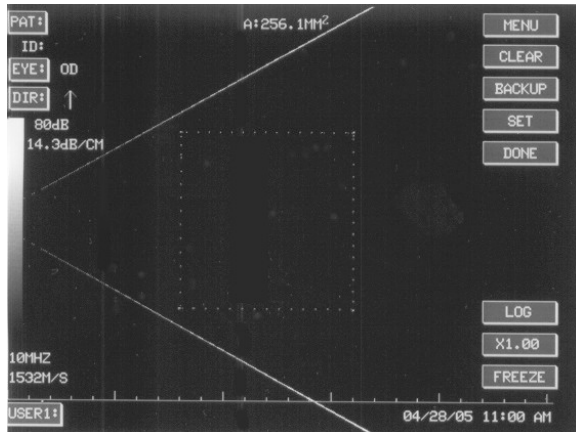


Fig. 31

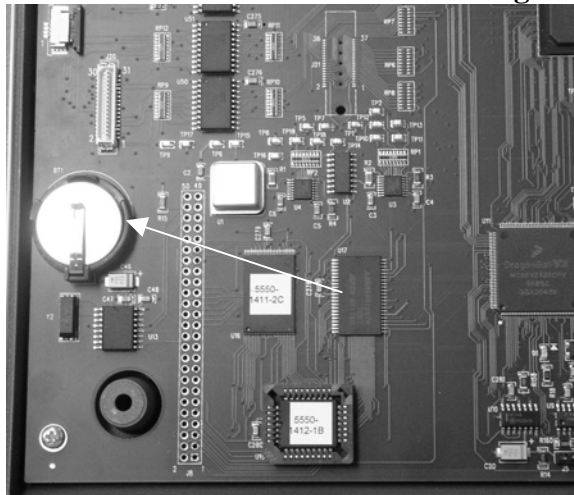


Fig. 32

7.11 Losing date, time, and user information

It is recommended that the unit be OFF before starting this procedure.

To replace the battery perform the following steps.

Turn the unit off.

Remove the four screws located on the bottom of the unit.

Turn the unit right side up. Carefully lift the top cover and LCD assembly. Locate BT1 on the main board. See figure #32 for reference and location.

Remove the defective battery by sliding it out of the holder. Installed the new battery. Be careful with the polarity, the positive side must face up.

Carefully reseal the top cover, and reinstall the four screws.

Trouble Shooting B5500+ con't.

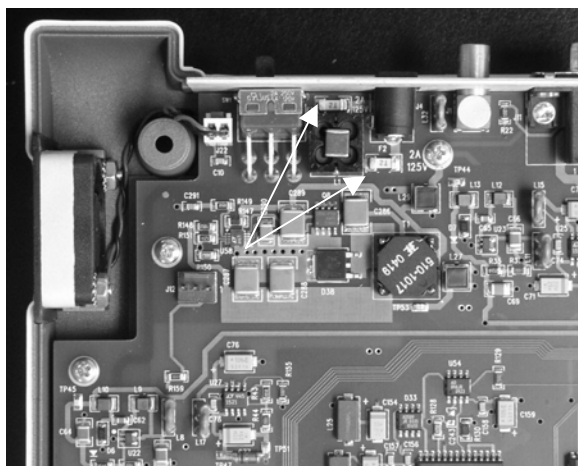


Fig. 33

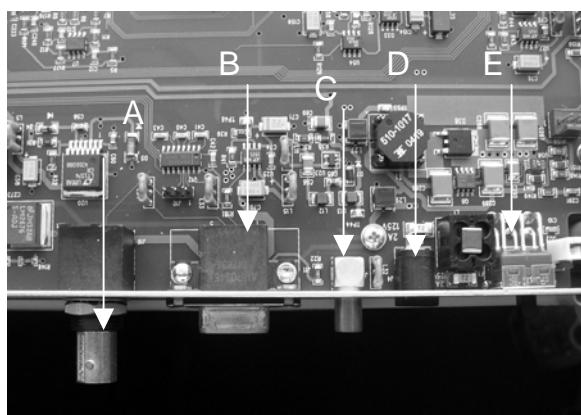


Fig. 34



Fig. 35

7.12 Unit does not Turn on

Verify that the A.C. outlet has power.

Using a voltmeter, verify that the E-Z Scan A.C. adapter P/N: 9200-1409-1A measures approximately 15Vdc at no load, or 15Vdc under load between J4 pin 1 and ground.

7.13 Rear Connector Descriptions

See figure #34 for rear connector descriptions.

- A. Video Out
- B. RS232
- C. Foot Switch
- D. Power
- E. On/Off

7.14 LCD Image is Upside Down

It is recommended that the unit be OFF before starting this procedure.

To verify that the LCD cable is seated properly perform the following steps.

Turn the unit off.

Remove the four Philips screws located on the bottom of the unit.

Turn the unit upside down and remove the bottom cover.

Remove the six mounting screws that hold the LCD Bracket to the Top Cover.

Remove the four screws that hold the LCD to the LCD Bracket.

Make sure the LCD cable is fully seated and add tape, as shown in figure #35.

Carefully reassemble the unit.

Trouble Shooting A/B5500+

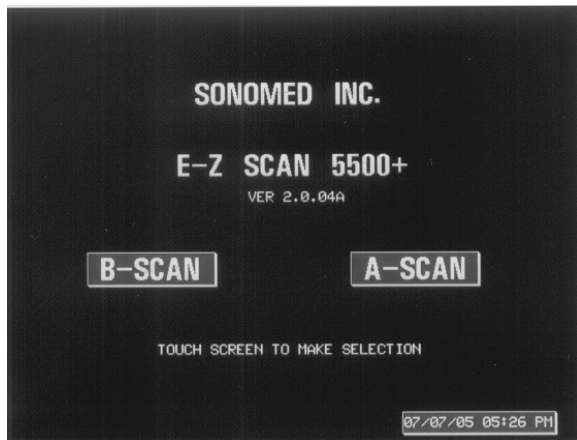


Fig. 36

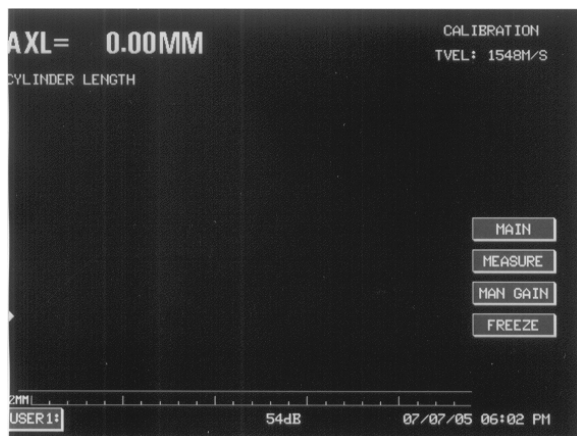


Fig. 37

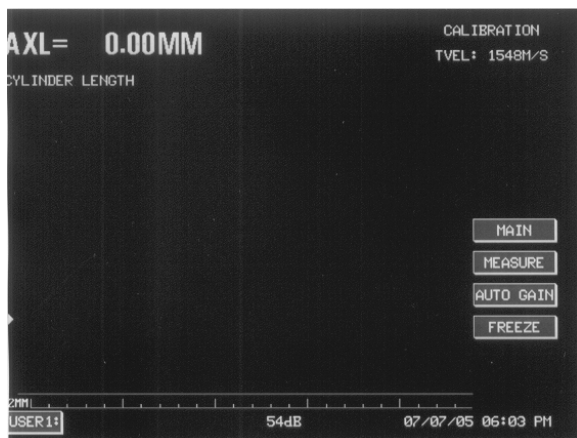


Fig. 38

8.1 A-Scan Calibration

Turn unit on.

The red LED on the tip of the A-Scan probe should be lit. If the LED is not lit, try a backup A-Scan probe. If the LED remains unlit, refer to section 8.5 or call Sonomed technical support.

Touch the A-SCAN field and the unit will display the screen as shown in figure #37.

Touch the MAN GAIN field and the unit will display the screen as shown in figure #38.

Touch the AUTO GAIN field.

With Ultrasound Gel applied to the tip of the A-Scan probe, position the A-Scan probe onto the Calibration cylinder (probe must be flat on the cylinder).

Touch the FREEZE field and the unit will freeze automatically as shown in Figure #39.

The unit will calibrate at a Gain of 70 – 74 dB and the measurement should be 9.9 – 10.1mm.

If the unit does not calibrate properly in the Auto mode, attempt the same procedure in the Manual Mode (set Gain at 60dB).

If both modes fail to calibrate properly, refer to section 8.4 and 8.5 or call Sonomed technical support.

Trouble Shooting A/B5500+ Con't

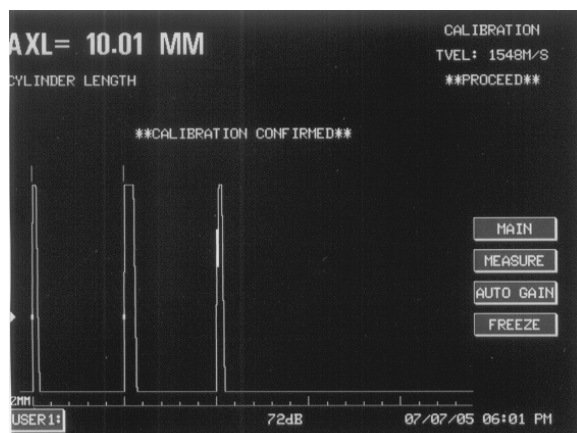


Fig. 39



Fig. 40

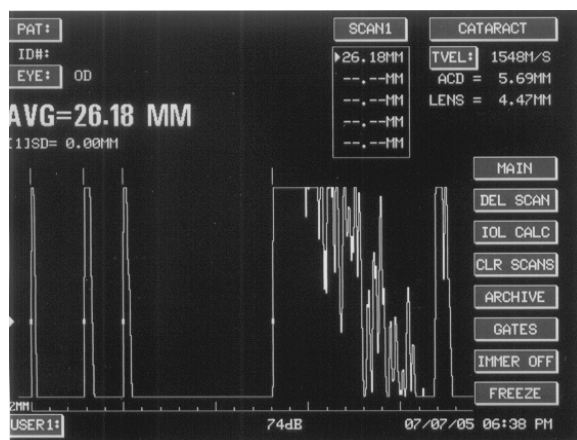


Fig. 41

8.2 Measure

Turn on unit.

Touch the A-SCAN field and the unit will display the screen as shown in figure #37.

Touch the MEASURE field and the unit will display the screen as shown in figure #40.

Be sure that the IMMER OFF field is activated (IMMER ON and IMMER OFF fields switch back and forth when touched).

Touch the FREEZE field, adjust the Gain to be 74 dB, and then perform a direct contact A-Scan. The unit will display the screen as shown in figure #41. If you can not obtain an image as shown, refer to section 8.4 and 8.5 or call Sonomed technical support.

8.3 Losing date, time and user information

Refer to section 7.11.

Trouble Shooting A/B5500+ Con't

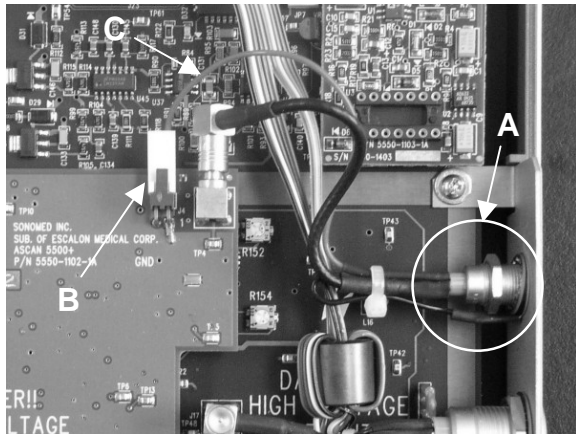


Fig. 42

8.4 A-Scan PCB

Turn unit off.

Remove the four screws that secure the top cover.

Verify that there are no broken wires (A) on the A-Scan Lemo connector and that the connector is seated properly (B) as shown in figure #42.

Verify that the red wire (C) attached to the connector is properly positioned in the Pin 1 of J4 location as shown in figure #42.

Verify that the RF connector, J1 is seated properly (D). Unplug and re-attach to verify proper seating.

Verify that the A-Scan PCB (E) is seated properly as shown in figure #43.

Remove the two screw (F) that secure the A-Scan PCB.

Remove the PCB and clean the connector contact (G) shown in figure #44, with a brush and alcohol .

Reseat the PCB. Secure the 2 mounting screws.

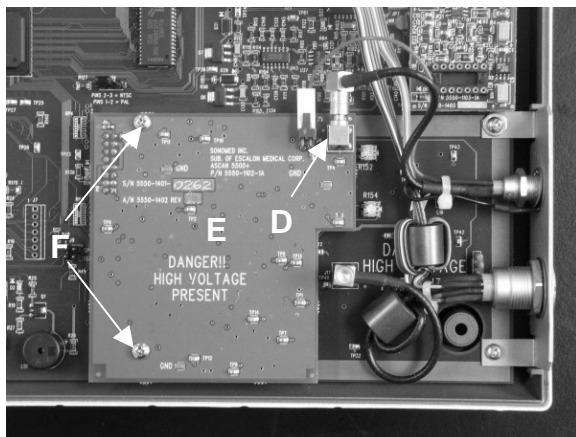


Fig. 43

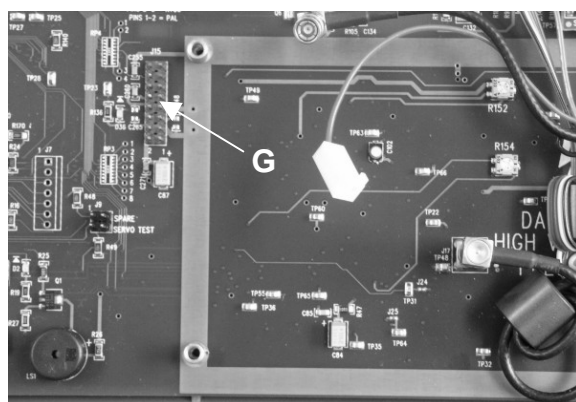


Fig. 44

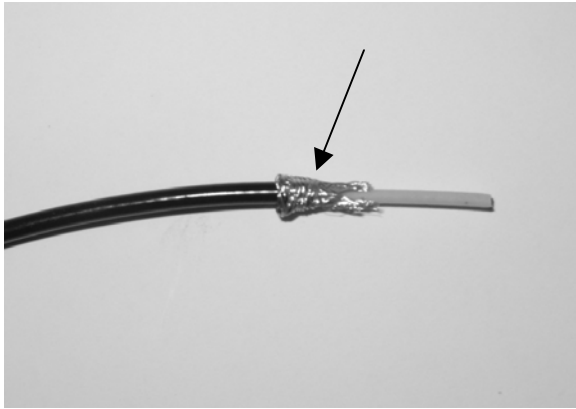


Fig. 45

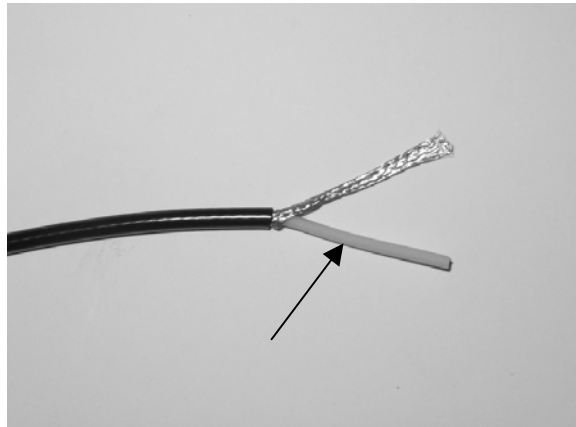


Fig. 46

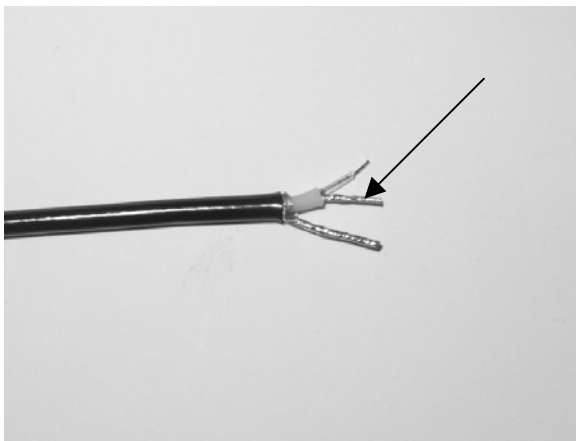


Fig. 47

8.5 A-Scan Probe Cable replacement

Order Sonomed Triax cable, Part number CA08-9901-44.

Strip the outer insulating jacket from the cable and push the braided shield down (outer shield) as shown in figure #45.

Carefully remove the cable within as shown in figure #46. This braided shield will be used as the LED conductor.

Remove the next layer of insulating jacket. Push the braided shield down (inner shield) and carefully remove the cable within, as shown in figure #47. This braided shield will be used as the ground conductor.

Remove the insulating jacket from the remaining conductor. This copper cable will be used for the transducer conductor, as shown in figure #47.

Prep the braided shields with solder as shown in figure #47.

Cut the defective cable 1 inch from the transducer as shown in figure #48 and prep the conductors as before.

Solder the outer shield to the outer shield, the inner to the inner and the transducer to the transducer.

Prep the conductors on the other end of the cable as before.

Remove the Lemo connector from the defective cable. The Lemo connector pin outs are as illustrated in figure #49. Clean and remove the three wires that attached the old cable. DO NOT remove the jumper from pin 3 & 4.

Trouble Shooting A/B5500+ Con't

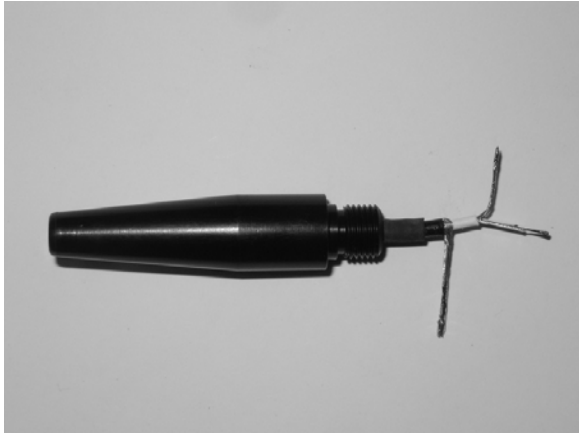


Fig. 48

Slide the A probe housing onto the new cable and place a section of shrink tubing over the cable. Prep this end of the cable as before.

Place a section of shrink tubing over the outer shield conductor and solder to pin 5 as shown in figure #50 (the shrink tubing should prevent this conductor from touching the others).

Solder the inner shield to pin 1.

Solder the copper conductor to pin 2.

Reassemble the housing.

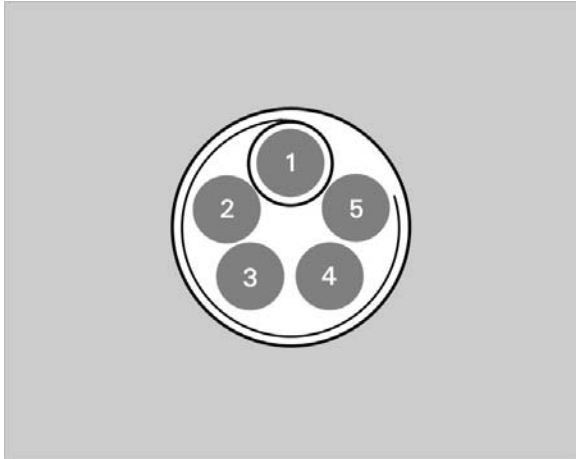


Fig. 49

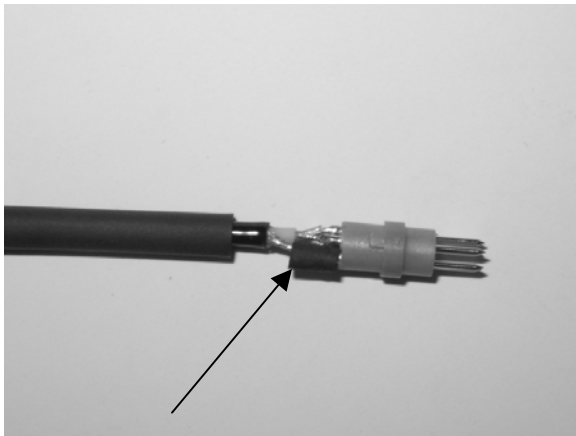


Fig. 50

Routine Maintenance

The maintenance described below should be performed routinely so that the E-Z Scan is always operating in a safe and reliable manner. Calibration check and probe examination, etc. are good practices to carry out prior to using the system. For example, checking the instrument calibration is necessary if reliable measurements are to be made, while a physical examination of the probe will lessen the possibility of injury to the eye. In any event, a routine consideration of all the items is a good practice and may help to avoid major problems in the future.

9.1 System General Inspection

1. Be sure the instrument is located on a flat, level and stable surface and in a comfortable viewing position.
2. Examine each item for any defects or damage.
3. Visually examine the instrument, prior to use, for loose or disconnected cables or cables which appear frayed or broken.
4. For electrical-shock protection, the AC adapter should only be plugged into a properly wired AC receptacle.
5. Verify that operational conditions are such as to prevent either small objects or liquids from entering the unit in order to prevent component damage or a fire hazard.
6. Verify that the foot pedal functions properly, is placed in a convenient location, and that the cable is free from becoming entangled.

9.2 Enclosure Cleaning

System: Periodic cleaning of the E-Z Scan enclosure with a soft cloth is all that is usually required to keep the system looking new. Stubborn stains may be removed using

a soft cloth dampened with a mild detergent solution.

CAUTION

Never use strong solvents such as benzene, acetone, thinner or abrasive cleansers as these may damage the system.

WARNING !

To prevent electrical shock, it is recommended that the power cord be disconnected prior to cleaning the system.

9.3 Probes Cleaning

The Probes must be cleaned and disinfected between patients to prevent the transmission of infections. It is the user's responsibility to ensure that the relevant standards are maintained and that the products and procedures are effective and appropriate for ophthalmic applications. The following information is provided for the guidance of users, and specific products are mentioned for illustration only. Products must be used in accordance with the particular manufacturer's instructions.

How to prevent patient-to-patient transfer of infection:

The probe must be cleaned between all patients to prevent patient-to-patient transfer of infection

The probe may be cleaned using Cidex liquid disinfectant, usually found in hospitals. Other FDA cleared disinfectants may also be used.

The Probe and cable can be immersed.

Do Not immerse the connector.

Routine Maintenance, con't

Do Not autoclave the probe or cable.

After cleaning, rinse the end of the probe thoroughly with clean water to remove all traces of the liquid used.

Follow the instructions on the label of the disinfectants.

The surfaces should then be dried with a lint-free cloth.

CAUTION

DO NOT soak probes in alcohol for extended periods of time, as damage can occur.

9.4 Storage

When not in use, it is recommended that the power cord be disconnected and the E-Z Scan be covered to keep dust and debris from entering the system. While stored the E-Z Scan should be protected from temperature extremes and humidity which can cause condensation within the unit. The probes should be removed from the E-Z Scan and stored where they will be protected from damage.

9.5 Probe General Inspection

1. The probes should be checked daily for function as well as for any visible damage.
2. Always check the cable for frayed or broken wires that may interfere with the proper functioning of the probe.
3. When connecting the probe to the instrument, be sure to align the red indicator dots on both the jack and cable connector.
4. Verify that the internal fixation light of the A-probe is operating.

5. Carefully examine the probe tip for any chipping or rough edges that may injure the cornea.

6. If applicable, examine the "Soft-Touch" mechanism of the A-probe to ensure that it slides freely and with minimal force.

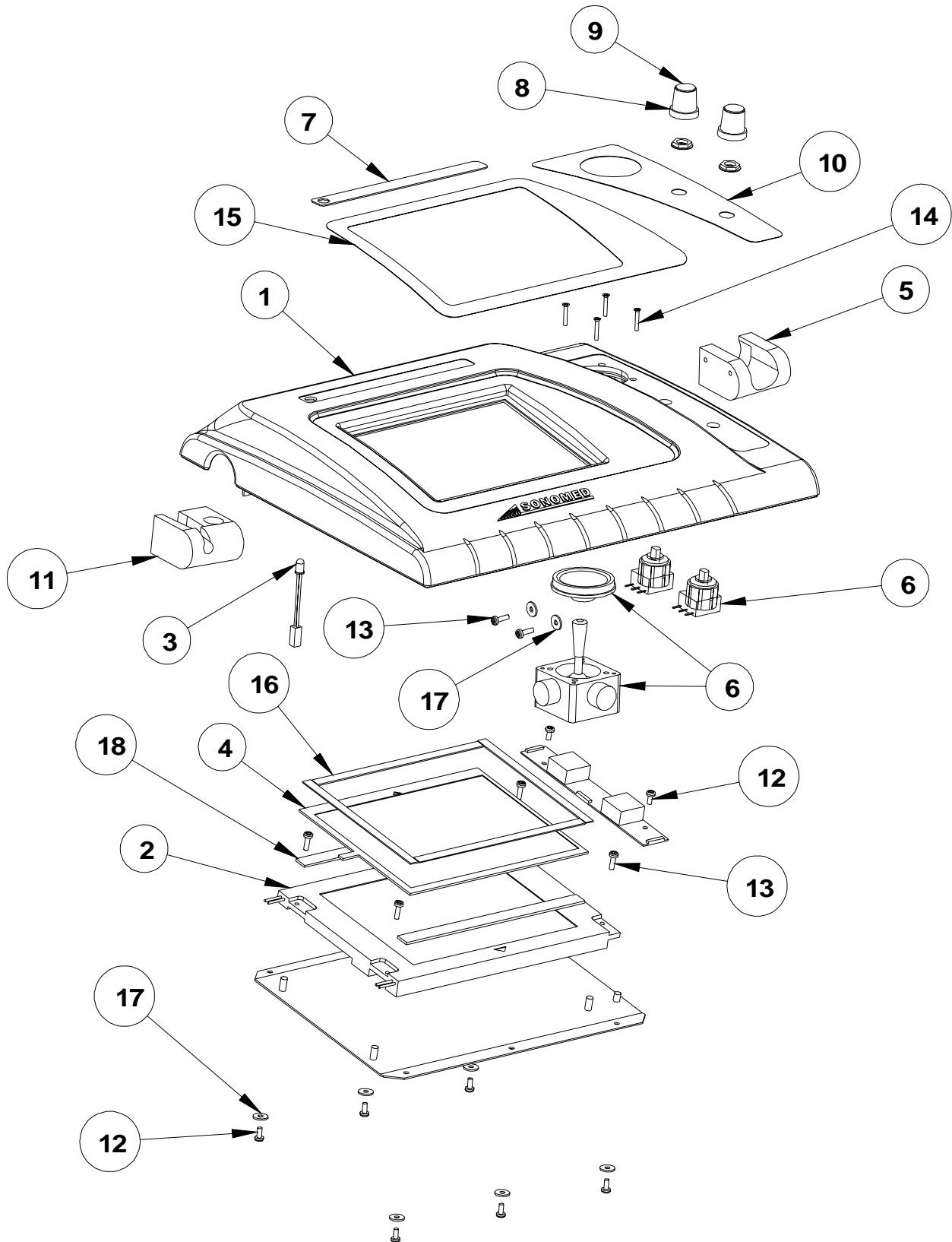
CAUTION

DO NOT attempt to disassemble or lubricate the slide mechanism as this may cause permanent damage to the internal components.

Top Cover Bill of Materials

FIND NO.	PART NUMBER	QTY	COMPONENT DESCRIPTION
1	5550-1511-1A	1	TOP COVER
2	5550-1413-1A	1	LCD DISPLAY
3	5550-1421-1A	1	POWER LED
4	SW08-0001-43	1	TOUCH SCREEN
5	5550-1513-1A	1	B-PROBE HOLDER
6	5550-1415-1A	1	ENCODERS AND JOYSTICK ASSEMBLY
7	5500-2202-1A 5500-2202-2A	1	TOP OVERLAY: FOR B-5500+ (PRODUCT NAME) FOR A/B-5500+
8	HW35-7250-60	1	KNOB ASSEMBLY
9	HW28-7150-81	1	KNOB CAP
10	5550-2206-1A	1	LABEL: CONTROL PANEL
11	5550-1512-1A	1	A-PROBE HOLDER (A/B-5500+ ONLY)
12	HW01-3106-42	6	#4-40 x 1/4" MACHINE SCREW: ZINC PLATED STEEL; PAN HEAD PHILIPS
13	HW01-3108-42	2	#4-40 x 3/8" MACHINE SCREW: ZINC PLATED STEEL; PAN HEAD PHILIPS ZINC PLATED STEEL
14	HW01-3081-44	4	#2-56 x 1/2" MACHINE SCREW: STAINLESS STEEL; FLAT HEAD PHILIPS ZINC PLATED STEEL
15	5550-2204-1A	1	LABEL: DISPLAY SCREEN BORDER
16	RM09-0005-47	4	TAPE: 1/32" x 1/4"; DOUBLE SIDED; BLACK
17	HW06-3005-74	8	FLAT WASHER #4; 1/8" ID X 5/16" OD; ZINC PLATED STEEL; ROUND
18	RM09-0004-47	2	TAPE: 1/16" x 3/8"; DOUBLE SIDED; BLACK

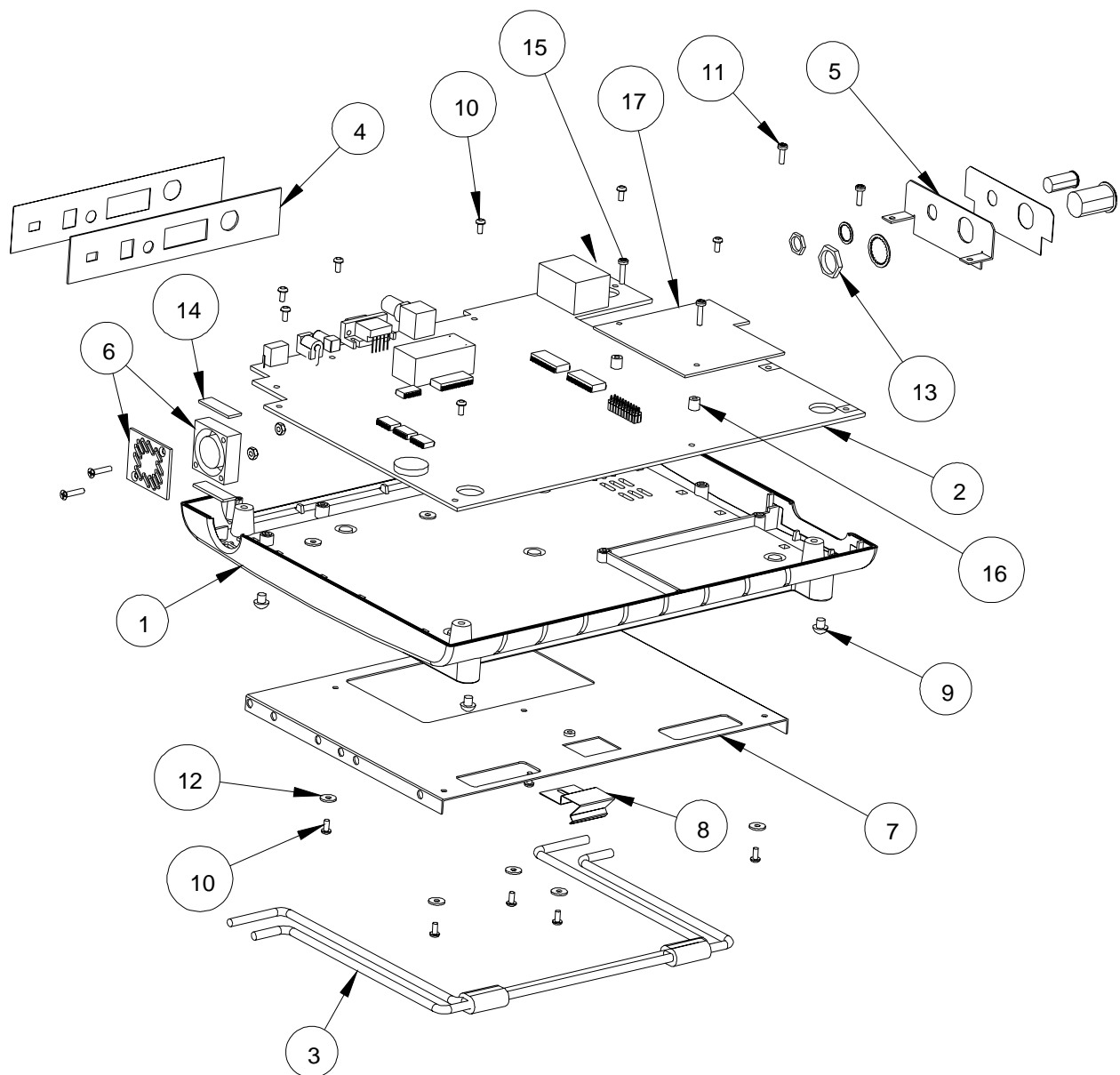
Top Cover Assembly Drawing



Bottom Cover Bill of Materials

FIND NO.	PART NUMBER	QTY	COMPONENT DESCRIPTION
1	5550-1510-1A	1	BOTTOM COVER
2	5550-1401-1A	1	MOTHERBOARD (B-5500+ AND A/B-5550+)
3	5550-1406-1A	1	BAIL STAND
4	5550-1407-1A	1	INPUT/OUTPUT CONNECTORS PANEL
5	5550-1408-1A	1	PROBE PANEL (B-5500+)
	5550-1408-2A		PROBE PANEL (A/B-5500+)
6	5550-1409-1A	1	FAN AND GRILL SUPPORT
7	5550-1503-1A	1	BAIL STAND TRAY
8	5550-1502-1A	1	SPRING CLIP
9	HW40-6512-74	4	STEM BUMPER; 1/32"DIA x 5/32"H; 5/16"OD; BLACK; RUBBER; ROUND
10	HW01-3105-42		MACHINE SCREW: #4-40 x 3/16"; ZINC PLATED STEEL; PAN HEAD PHILLIPS
		14	B-5500+
		12	A/B-5500+
11	HW01-3106-42	2	MACHINE SCREW: #4-40 x 1/4"; ZINC PLATED STEEL; PAN HEAD PHILLIPS
12	HW06-3005-74	5	FLAT WASHER #4: 1/8" ID x 5/16" OD; ZINC PLATED STEEL; ROUND
13	HW07-3653-57	1	LOCK WASHER: #1/2; STAINLESS STEEL; INTERNAL TOOTH
14	HW04-2652-71	2	NUT: #1/2"-28 NEF; THIN; NICKEL-PLATED BRASS; HEX
15	HW01-3110-42	2	MACHINE SCREW - #4-40 x 1/2"
16	HW12-7201-75	2	SPACER #4 x 1/4"; 1/4" OD; NYLON; ROUND (A/B-5500+)
17	5550-1402-1A	1	A-SCAN PULSER RECEIVER BOARD (A/B-5500+)

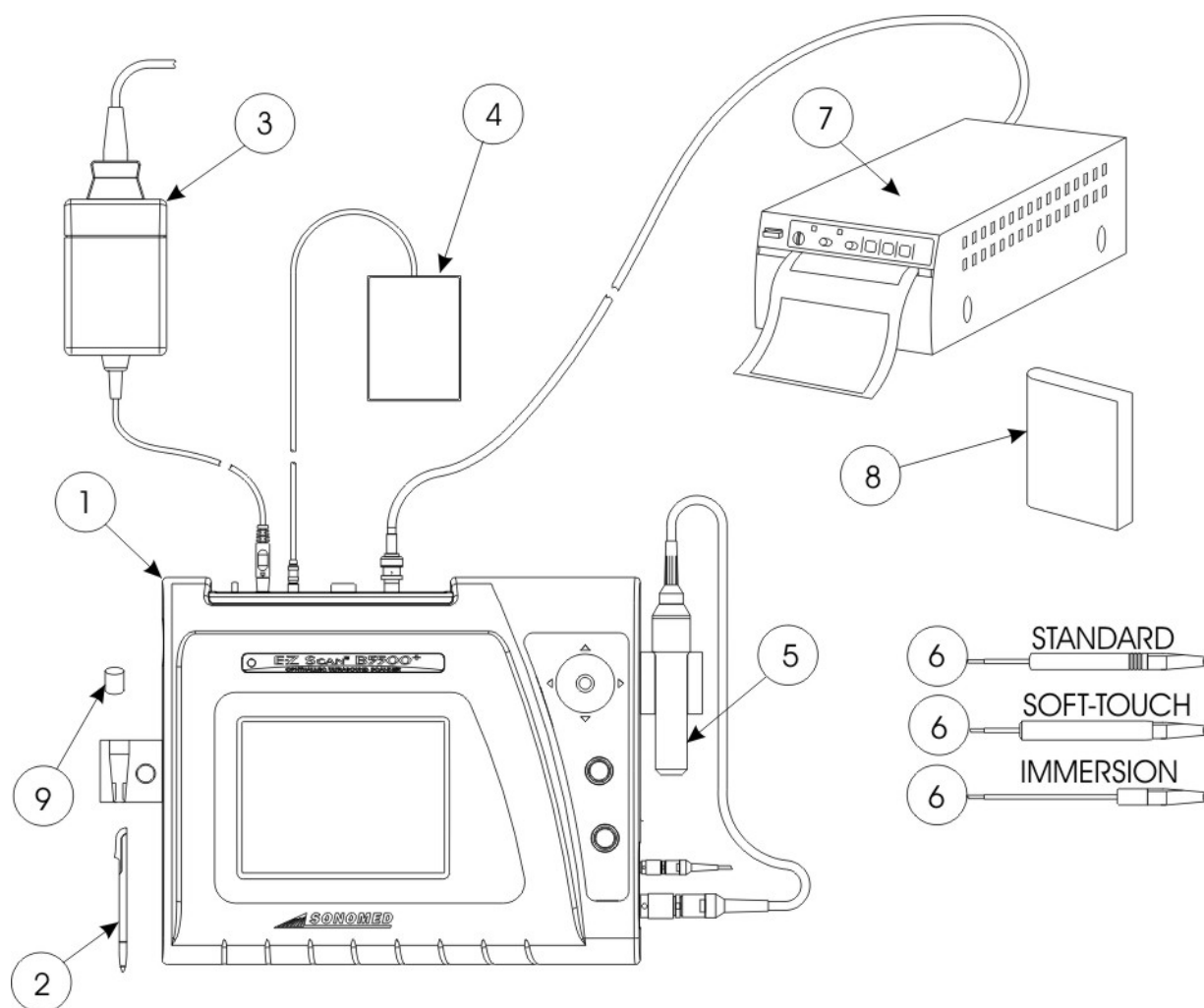
Bottom Cover Assembly Drawing



Accessories Bill of Materials

FIND NO.	PART NUMBER	QTY	COMPONENT DESCRIPTION
1	5550-1403-1A (or)	1	UNIT (B-5500+)
	5550-1403-2A (or)	1	UNIT (A/B-5500+)
	5550-1403-3A	1	UNIT (A-5500+)
2	MC01-0001-99	1	TOUCH SCREEN STYLUS
3		1	AC ADAPTOR: 15V @ 2A:
	9200-1409-1A (or)	1	NORTH AMERICA; JAPAN; TAIWAN
	9200-1409-2A (or)		EUROPE
	9200-1409-3A (or)		UNITED KINGDOM
	9200-1409-4A		AUSTRALIA
4	9200-1407-1B (or)	1	FOOT SWITCH: STANDARD, 1 PIN
	9200-1415-1A		FOOT SWITCH: WATERPROOF, 1 PIN
5	9000-1408-1B	1	B-SCAN PROBE: STANDARD 10MHz
6	9000-1410-1A (or)	1	A-SCAN PROBE: STANDARD; 10MHz
	9000-1410-2A (or)		A-SCAN PROBE: SOFT-TOUCH; 10MHz
	9000-1410-3A		A-SCAN PROBE: IMMERSION; 10MHz
7	PR04-0001-42	1	VIDEO PRINTER: 3.9 SEC.; 1280 DPI; INTERFACE PARALLEL (IEEE 1284) & USB MEMORY 8 MB; HIGH GLOSS, 120V-240V
8	5550-1901-1A	1	INSTRUCTION MANUAL
9	9200-1512-1B	1	A-SCAN CALIBRATION CYLINDER

Accessories Drawing



Clock Generator Schematic

**SCHEMATIC INSIDE FOLDER
BEHIND THIS TITLE PAGE**

Front End Interface Schematic

**SCHEMATIC INSIDE FOLDER
BEHIND THIS TITLE PAGE**

Power Supply Schematic

**SCHEMATIC INSIDE FOLDER
BEHIND THIS TITLE PAGE**

Pulser Receiver Schematic

**SCHEMATIC INSIDE FOLDER
BEHIND THIS TITLE PAGE**

Servo Controller Schematic

**SCHEMATIC INSIDE FOLDER
BEHIND THIS TITLE PAGE**

System Processor Schematic

**SCHEMATIC INSIDE FOLDER
BEHIND THIS TITLE PAGE**

Video Interface Schematic

**SCHEMATIC INSIDE FOLDER
BEHIND THIS TITLE PAGE**

Xilinx Configuration Schematic

**SCHEMATIC INSIDE FOLDER
BEHIND THIS TITLE PAGE**

Xilinx Power/Decouple Schematic

**SCHEMATIC INSIDE FOLDER
BEHIND THIS TITLE PAGE**

Xilinx RAM Interface Schematic

**SCHEMATIC INSIDE FOLDER
BEHIND THIS TITLE PAGE**

Xilinx Test Ports Schematic

**SCHEMATIC INSIDE FOLDER
BEHIND THIS TITLE PAGE**